

Kniele GmbH, 88422 Bad Buchau, Germany

# Patented mixing technology for innovative precast lightweight concrete elements

■ Mark Küppers, CPI worldwide, Germany

**CBS Home manufactures precast concrete elements using its CBS System – CBS stands for Compound Building System. Precast concrete elements produced with this method are made up of a load-bearing structure of thin profiled galvanised steel sheets and lightweight concrete. The long-term success of the system is beyond doubt for the company. CBS Home has recently built a production facility with the impressive external dimensions of 13,000 m<sup>2</sup> on a greenfield site in Deißlingen, Baden-Württemberg, Germany. For several months now, prefabricated concrete elements have been manufactured at this site exclusively according to the patented CBS system, which is registered under generally valid building permit number Z-14.5-883.**

According to information from the company, this CBS technology can be employed to individually plan and create a wide range of buildings according to customer wishes, including detached houses, semi-detached houses, town houses, apartment blocks, and residential complexes, as well as hotels, office buildings, storage areas, garages and multi-storey car parks.

The only reinforcement for the precast is the steel supporting structure, which is completely filled and encased by foamed lightweight concrete based on expanded clay. CBS precast elements have proven high load-bearing capacity and low thermal conductivity. 1.00 mm thick profiles set up vertically are connected by 2.00 mm thick horizontally positioned U profiles. Each of these galvanised profiles is cold-formed with its own special geometry, which can be individually manufactured in the production facility with a profiling machine using sheet steel coil.

Since the filigree lightweight steel supporting structure is fully encased, the gross cross-section of the profile can be credited to the load-bearing structure and added to the structural properties of the lightweight concrete. The layer thickness or requirements regarding any additional thermal insulation can also be reduced due to the lightweight concrete's low thermal conductivity. Supplementary construction measures can be carried out at the production facility as the lightweight concrete used is self-compacting and thus does not have to be compacted by vibration. Windows and door frames, for example, can be completely encased in concrete.



*CBS Home's new production facility in Deißlingen, Baden-Württemberg, Germany*

Valuable time can also be minimised on construction sites as all elements are manufactured to fit precisely. Any relevant post-processing of components is carried out at the production facility. Further savings on time are achieved because electrical conduits, sanitary installations, door frames and windows can be pre-installed. These are fixed to the supporting structure and fully grouted into the structural element with lightweight concrete. CBS also promises additional advantages during transport and handling due to the lower weight of the prefabricated elements.

## PRECAST CONCRETE ELEMENTS

### Advanced dosing and mixing technology as the basis for CBS prefabricated elements

Expanded clays in various particle sizes plus sands are stored in a total of six aggregate silos integrated into the building and thus protected from the weather. Larger gravel sizes are not utilised in producing the lightweight concrete. Kniele has installed two dosing conveyor belts under each silo of the

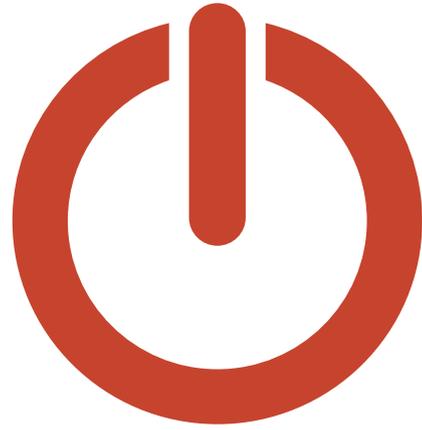


Six covered aggregate silo chambers for sand and Liapor expanded clay



Aggregates are dosed via 12 conveyor belts (2 per silo)

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Aggregates are dosed and weighed in a travelling weighing unit and then transferred to a Kniele feed elevator

in-line silo system. The dosing belts feature high dosing accuracy and are suitable for all aggregates. Sand moisture is determined directly during dosing. The aggregates are dosed into a weighing unit, which moves back and forth under the 6 silos, to be weighed precisely.

After that, the aggregates for the next concrete batch are transferred to the feed elevator. Kniele has equipped this feed elevator, which transports the material from the basement level to the mixer on the upper floor level, with a fall safety protection system.

#### Fall safety protection system

Kniele material elevators possess a safety protection device against wear and overloading. This device is designed to reliably prevent falls during upward travel. It intervenes in the case of overloading or cable wear and switches off the system or gives a warning signal, hereby reducing the danger of a fall very significantly.

Two cement silos of 82 m<sup>3</sup> with cement augers were installed in front of the hall for storing cement. One silo has been designed as a single-chamber unit, the second has a double-chamber. Optionally, a third silo can be added; this has already been taken into account on site by means of an additional foundation.

Chemical admixtures are weighed with a versatile Würschum liquid weighing unit, which is calibratable and designed for 6 admixtures. Discharge can either take place in free fall or via discharge pumps into the respective mixer. The cement weighing unit is again from Kniele.

The weighing units and the dust extraction system are located one level directly above the mixer. The mixer itself is mounted on a 27 m long platform. The mixing supervisor's control room with its switching cabinets and control computer is also located there. Bikotronic was responsible for the software and control technology of the entire mixing system.

A crane system above the mixer level was also provided to enable tools, spare parts or other materials (e.g. for manual feeding into the mixer) to be hoisted flawlessly onto the platform.

#### Kniele KKM Cone Mixer

The core component of the new mixing system is, of course, the mixer itself. At CBS Home, it is the KKM 2250/3375 Cone Mixer from Kniele with an output of 2.25m<sup>3</sup>. This patented KKM mixer type is tried and tested internationally and has been in successful use for almost two decades with ongoing advances in its development. It has gained the appreciation of many concrete producers with its very high performance, quality and reproducibility.



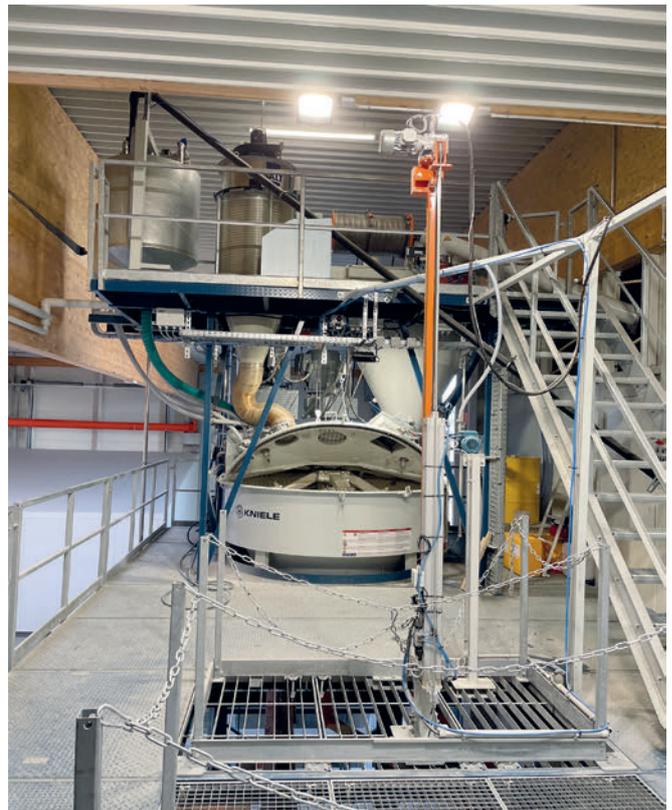
KKM 2250/3375 Cone mixer made by Kniele

**Well-proven mixing technology  
with internal and external agitator**

Two counter-rotating, adjustable-speed agitators can produce homogeneous concrete mixes in the cone-shaped mixing container in just a short time. The inner agitator transports the material from the bottom to the top via an Archimedean auger; the outer agitator scours the container's surface and conducts the mixed material to the inner agitator. Kniele emphasised that this mixing system, in combination with the conical mixing trough, has the advantage that the entire mix is completely in motion at all times.



View into the cone-shaped mixing chamber with its two mixing paddles



Cleaning lance for the concrete spreader

**Finishing line for Precast 3D bathrooms**



The mixer is equipped with a water dosing system that will handle both coarse and fine dosing. The mixer trough is lined with ceramic for durability. On top of this, Kniele has installed a mixer dust extraction system in combination with an IP mixer camera at the CBS production facility in Deisslingen-Lauffen.

A Gertec foam generator delivers the desired consistency of lightweight concrete.

An automatic high-pressure cleaning system, equipped with rotary heads and retractable lance, ensures that the complete mixer trough and the two agitators are cleaned thoroughly.



Located above the mixer, among other things, the dust extraction system and an admixture dosing unit made by Würschum



View of the control room

The cone mixer's design with its good accessibility facilitates quick, easy cleaning. The wash water is emptied downwards by gravitational force alone to be fed directly to the recycling plant for treatment.

### Ecofrog recycling system

An Ecofrog recycling system was installed at CBS for recycling residual concrete. A swivelling hopper can be placed under the mixer so that cleaning water is discharged directly into the recycling unit during high-pressure cleaning. A recycling pool with agitator and sedimentation basin was constructed in an outdoor area. CBS Home has thus paved its way for manufacturing precast in a sustainable and environmentally friendly manner and can boast state-of-the-art residual concrete and wash water processing facilities.

The Kniele KKM Cone Mixer discharges the concrete directly into the concrete spreader, which is engineered as a gantry unit and can serve several production pallets on two parallel lines at the same time. The gantry design is a preferred choice for circulation systems; the concrete spreader can be operated fully / semi-automatically.

Kniele has also supplied the solution for cleaning the concrete spreader, consisting in a retractable cleaning lance specially developed by Kniele for concrete spreaders. The concrete spreader also discharges concrete residues and wash water directly into the Ecofrog recycling system for processing.



Recycling pool with agitator and sedimentation basin



*CBS precast elements now stripped of their formwork before being transported to the external storage area*



*Sample elements in the production hall*



### Cleaning lance for concrete spreaders

In the case of concrete spreaders, a retractable lance with a rotating cleaning head - based on the high-pressure cleaning system used with Kniele Cone Mixers - is inserted into any containers needing cleaning; the head's rotation makes sure they are cleaned thoroughly. The process starts fully automatically - either as an intermediate or post-production cleaning process - when the concrete spreader moves to its predefined washing position. Cleaning times can be adjusted according to need as it possesses a small control unit and is connected to a high-pressure system.

### High numbers of individual precast elements made of lightweight concrete

A total of 48 pallets measuring 3.40 x 10.40 m enables CBS Home to manufacture individual prefabricated components made of lightweight concrete in considerable quantities. Each precast element is produced specifically according to project. Standard prefabricated elements that could be produced for stock are not part of the young German company's portfolio. CBS Home is very satisfied with the initial response to its innovative precast elements and is consequently extremely optimistic about the future. Although production is currently in the initial stages, capacity utilisation will soon increase substantially and the production line will be running at full capacity until the end of the year. ■



Video about the CBS System

FURTHER INFORMATION



CBS Home GmbH  
Im Bettinger 17  
78652 Deißlingen-Laußen, Germany  
T +49 7726 9387240  
[info@cbs-home.de](mailto:info@cbs-home.de), [www.cbs-home.de](http://www.cbs-home.de)



Kniele GmbH  
Gemeindebeunden 6  
88422 Bad Buchau, Germany  
T +49 7582 9303 11, F +49 7582 9303 30  
[info@kniele.de](mailto:info@kniele.de), [www.kniele.de](http://www.kniele.de)



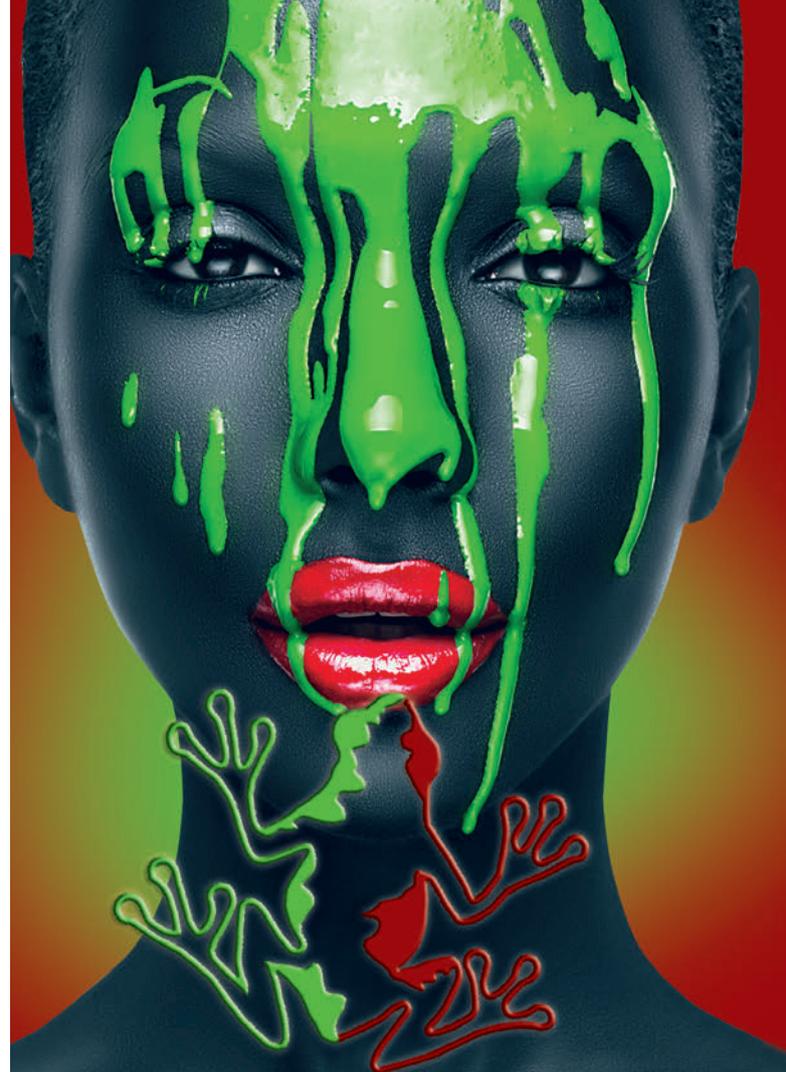
Bikotronic Industrie Elektronik GmbH  
Im Hohen Acker 7  
67146 Deidesheim, Germany  
T +49 6326 96530, F +49 6326 965350  
[info@bikotronic.de](mailto:info@bikotronic.de), [www.bikotronic.de](http://www.bikotronic.de)



ecofrog GmbH  
Heinkelstr. 13-15  
68804 Altlußheim, Germany  
T +49 6205 204820, F +49 6205 2048220  
[info@ecofrog.eu](mailto:info@ecofrog.eu), [www.ecofrog.eu](http://www.ecofrog.eu)



Würschum GmbH  
Hedelfinger Straße 33  
73760 Ostfildern, Germany  
T +49 711 448130, F +49 711 4481340  
[info@wuerschum.com](mailto:info@wuerschum.com), [www.wuerschum.com](http://www.wuerschum.com)



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**ecofrog® GmbH**

**Dornierstr. 2 • 68804 Altlußheim • Germany**  
**Tel. +49 6205 20482-0 • [info@ecofrog.eu](mailto:info@ecofrog.eu)**  
**[www.ecofrog.eu](http://www.ecofrog.eu)**